Drosera neocaledonica: Its Origins, Habitat and Cultivation

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Introduction

The island of New Caledonia, in the south west Pacific Ocean, has a remarkable flora of over 3000 flowering plants on an area of about 18,600 km^2 . Amongst these is an endemic sundew, *Drosera neocaledonica* (Jones & Wilson, 1987). A summary of the geological history of the island group, with reference to emergent land and its profound influence on the flora, and the present conditions in which the sundew grows is presented.

New Caledonia is a French Overseas territory consisting of a number of island groups. Many are raised coral atolls, particularly the Loyalty Group, which have well-drained alkaline soils unsuitable for this sundew, and will not be discussed further here. The main island, "La Grande Terre", and associated rocky islands to the north and south have origins going back 400 million years when the basement rocks were deposited on the continental shelf of eastern Gondwana, with emergent low land of proto-Australia to the west. From 180 to 80 million years ago the bulk of the island's rocks formed between an island arc and the trench to the east, in a setting analogous to the present day Ryukyu Islands south of Japan. Between 80 and 60 million years ago the Coral and Tasman Seas opened by sea-floor spreading and extension and thinning of continental crust, moving proto-New Caledonia over 1000 km to the east, to about its present longitude. As volcanic activity around the ancestral island waned, emergent areas were maintained by block faulting; then, about 50 million years ago, a slice of young, hot oceanic crust was thrust over the island during a boundary adjustment of the Australian plate. Since then much of the oceanic crust has altered to serpentine, was deeply weathered, and then was removed by erosion, and local uplift has begun in the south as the island group begins to enter the Vanuatu Trench (Paris, 1981).

The geological history of New Caledonia has had a profound impact on the islands' flora, and goes a long way to explaining the high degree of endemism (i.e. plants and animals found nowhere else). This is essentially a relict flora from eastern Gondwana of about 70 million years ago, which has since evolved in isolation with filtered exchange with Australia and adjacent island groups. The oldest fossil land plants on New Caledonia are 180 million years old and consist of leaf fragments of extinct species of the Lauraceae, Aracauraceae, Araliaceae and Podocarpaceae; which still have species in the islands' present flora. The evolution of the islands' flora was given a further boost by the emplacement of oceanic crust composed of serpentine minerals rich in iron, magnesium, cobalt and nickel and poor in such major plant nutrients as calcium. This combination of minerals results in a soil toxic to most plants. The plants which adapted to this environment now form the remarkable sclerophyllous shrubland, or "maquis", which occurs occurs on almost all of the 6,000km^2 of oceanic crust sheet still exposed on the island (Schmid, 1987).

Figure 1: An open flower of *Drosera neocaledonica* on one of Eric Green's plants. Note the glass-like transparent styles.

Climate and Topography

The present day main island is rectangular in outline, 400 km long by 50 km wide with the long axis aligned north-west to south-east, that is parallel to the almost incessant south-east trade winds. It is a mountainous island with much land above 600 metres; the highest peaks are Mount Panie (1628m) and Mt Humboldt (1618m). Average annual rainfall is generally from 1000 mm/year to 3500 mm/year, but reaches 8000 mm/year near Mount Panie. The average monthly maximum and minimum temperatures for the capital, Noumea, are given in the following table, and may be used to estimate temperature ranges for other parts of the island using the lapse rate of approximately a 1°C temperature fall for every vertical 100 metres climbed.

	J	F	M	A	M	J	J	A	S	O	N	D
Max.	30	29	29	28	26	25	24	24	26	27	28	30
Min.	22	23	22	21	19	18	17	16	17	18	20	21

Table 1: Average minimum and maximum temperatures in degrees Celcius for Noumea (elevation 5 metres above sea level). From Logan and Cole (1997).

Absolute temperatures recorded on the island include a maximum of 35°C at Noumea and 0°C at 1000 m elevation in the centre of the island. It is not uncommon for winter minium temperatures to fall to +5 to +8°C in the islands' interior. Due to the strong trade wind influence the relative humidity stays around 75% during the year.

Plant Morphology

Drosera neocaledonica Hamet is a distinctively hairy rosetted sundew, measuring up to 60 mm across, and which ultimately forms stems to 120 mm tall (see Back Cover). The leaves are narrowly spathulate with a slender petiole commonly 20 mm long by 1 mm wide, that supports an ovate lamina 5 mm long by 2 mm wide. Both sides of the petiole have conspicuous white pilose glandless hairs; shorter appressed white hairs occur under the lamina. The scape grows up to 250 mm tall, and bears up to 20 flowers in a one-sided raceme. The scape has a weakly ascending base, with pilose white glandless hairs, however the majority of the scape has a cover of short stalked red glands.

Each flower is open for less than a day and has white, unscented petals 6 mm long. The ovary is surmounted by three colourless bifid styles which are further divided at the apex into variably divergent terete terminal segments on which the stigmatic surfaces are located (Figures 1, 2). The seed is ovoid, black, shiny, 1 mm long by 0.2 maximum diameter with reticulate vernation, and is produced by cross-pollination. Flowers have been recorded from July to December.

Habitat and Distribution

The sundew is widespread over the southern part of the island (Figure 3) and has been collected from sea-level to 1000m altitude. It grows in both peaty sand along drainage lines and around springs and also in dry-surfaced laterite gravel. Plants grow in full sun, to the shaded conditions at the base of shrubs and have even been observed growing under shallow water; the latter occurring as clonal plants on the exposed roots of plants growing on a creek bank.

Affinities

Drosera neocaledonica has a chromosome count of 2n=40, which is the same as *D. spatulata* "Kanto Form" which grows in eastern Australia (Kondo, 1976). It would appear that both sundews have a common ancestor which may have grown around 80 millions years ago, before the opening of the Tasman and Coral seas. Perhaps it is not surprising that populations of *D. spatulata* in central Queensland also share divergent divided style apices (Pearson and Pearson, 1999: page 177).

Cultivation

Surprisingly this sundew has proven tricky to grow in cultivation. Based on observations of plants in the wild and seeing plants in cultivation in Australia, South Africa and Europe, this species is adaptable to a range of soil types and grows readily in a mix of sphagnum peat and quartz sand. They grow in areas with high humidity. Whilst it is native to the tropics it is not exposed to sweltering conditions. Some higher elevation populations are exposed to temperatures of 5°C or even lower. Overall, the plant is likely to thrive in cultivation conditions which suit most highland species of *Nepenthes*. Propagation is easy from seed, which ripens from mid spring to mid summer in the wild, and the species may also be propagated by

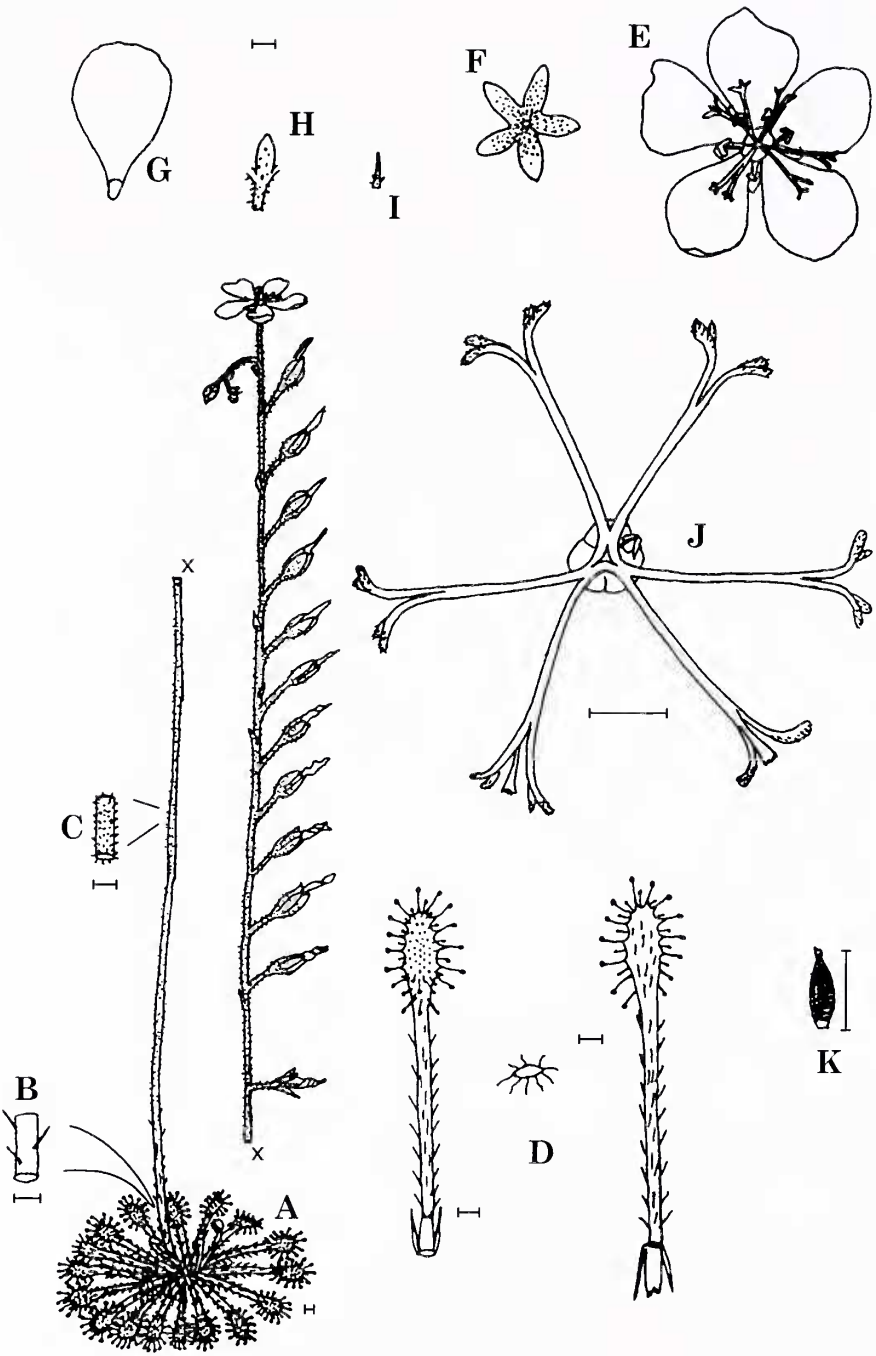

Figure 2: Botanical illustration of *Drosera neocaledonica* grown by Eric Green. A: Plant in flower; B: basal part of scape showing sparse hair cover; C: central part of scape with glandular hair cover; D: lamina; E: open flower; F: calyx; G: petal; H: sepal; I: bracteole; J: style; K: seed. Scale bar = 1 mm.

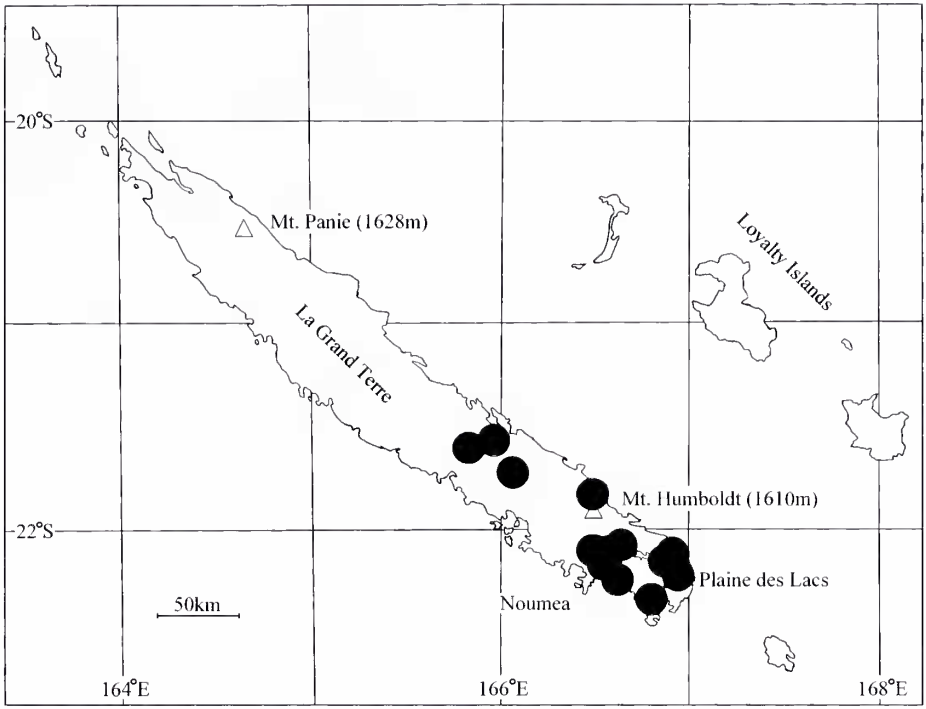

Figure 3: Sites for *Drosera neocaledonica* in the wild. Each dot denotes a location recorded on herbarium specimens I inspected, or sites I visited in my travels. The capital, Noumea, highest peaks of the island and the carnivorous plant-rich Plaine des Lacs are indicated.

leaf and root cuttings.

At least two artificial hybrids involving *D. neocaledonica* have been raised to date (*D. neocaledonica* × *aliciae*, *D. neocaledonica* × *spatulata*). The former has been grown in Japan for a number of years (e.g. Anon., 1996). The latter was recently made by myself using pollen from a pink-petalled *D. spatulata* from Jamberoo, New South Wales, Australia and one of Eric Green's *D. neocaledonica* plants. In both cases the hybrid appears more vigorous than the New Caledonian parent.

Conclusion

Drosera neocaledonica is a fascinating rosetted sundew, which is part of a rich endemic flora that has evolved in isolation on New Caledonia. The development of this species is linked to the geological history of the island. Climatic details and observations of the plant in the wild have been provided to assist in the cultivation of this sundew which has a great pedigree and history.

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parents for providing the amazing opportunity to do field work on the most amazing island of New Caledonia.

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Book Review: Food Webs and Container Habitats: the Natural History and Ecology of Phytotelmata

Reviewed by Rudolf Schmid

Kitching, R. L., 2000, Cambridge University Press, Cambridge. 431 pp., ISBN 0-521-77316-4, $100.00 (hardbound).

"Phytotelmata," a word coined in 1928 by L. Varga, refers to the localized aquatic habitats found in plant containers such as tank bromeliads, tree holes, bamboo internodes, pitchers of insectivorous plants, axils of leaves and reproductive structures (e.g., *Dipsacus sylvestris*, and especially the large tropical monocotyledons), and fallen fruits. Although this excellent work is an essential addition to the field of food-web community ecology, systematists and plant morphologists will benefit from reading the first fascinating 89 pages on the flora, fauna, and environment of phytotelmata. Most of the book (209 pages) is on the food webs created by the animal communities found in the phytotelmata; this part, although still fascinating, will appeal mainly to ecologists interested in food-web studies or to specialist botanists enchanted by their pet groups—pitcher plants, bamboos, etc. An 84-page appendix deals with the nine animal phyla found in phytotelmata. The book is very rich in detail; the 59 tables and 105 figures (chiefly graphs) not only synthesize the diverse literature (the bibliography involves 34 pages) but also present much previously unpublished information. The book has only six photographs, all of Bornean species of *Nepenthes*, and all of poor quality.

Kitching, an Australian, discusses the classic pitcher plants: *Cephalotus follicularis*, *Darlingtonia californica*, *Heliamphora* spp., and especially *Sarracenia* spp. and *Nepenthes* spp. He does not discuss the recent cases of *Brocchinia* and *Catopsis*. Pages 21-25 give general information on pitcher plants; pages 203-208 and 219-231 discuss food webs in pitchers of six species of *Nepenthes* in Borneo; elsewhere there are several dozen scattered references to various pitcher plants.

(Much of this review already appeared in Taxon, reprinted with permission—Ed.)